

Nutritional status and blood pressure among adolescents in Miraj, Maharashtra

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Abstract

Objectives: Hypertension is the leading risk factor, ranking third for mortality rate. This study is to access the relationship between the childhood obesity which leads to hypertension during adolescents.

Study design: A cross-sectional study was conducted at Miraj from August 2009 - September 2010, among 2370 adolescents in the age group of 10-19 yrs. A pre-designed, pre-tested structural questionnaire was used for data collection. Physical examination, which includes anthropometric measurements such as height, weight and blood pressure. Mean, standard deviation and χ^2 test were used for statistical analysis.

Results: The prevalence of hypertension was 1.1% and highest prevalence (2.9%) was observed in the age group of 18-19 years. Overall prevalence of obesity was 3.0%. The prevalence of hypertension was 26.7% in obese adolescents.

Keywords: Nutritional status, Blood pressure, Hypertension, Obesity

1. Introduction

One of the most important commitments a country can make for future economic, social and political progress and stability is to address the health and development needs of its adolescents (WHO, UNFPA & UNICEF, 2010). Most nutrition research in the developing world focused on children under the age of five. Studies have shown that many of the developing countries including India are facing the dual burden of under-nutrition and over-nutrition.

The emergence of obesity and its sequel as public health problems has renewed interest in the adolescent anthropometry. Such a focus is important in India as it has a huge adolescents and children population along with the existing economic, social, and health inequalities among the general population. A systematic elucidation of the rationale for such a focus in primary prevention research is proposed (Mano & Anura, 2004).

Owing to the well-established childhood obesity epidemic, the population prevalence of high blood pressure in the young is increasing (Munter et al., 2004). Evidence for a direct, strong and consistent relationship between weight and blood pressure emerges from cross-sectional and prospective observational studies. In most studies, being overweight is associated with a 2-6 fold increase in the risk of developing hypertension (WHO, 1992).

Most cross-sectional studies in children have shown a strong positive relationship between blood pressure and height, weight, and various indices for body mass. Body weight is also a predictor of elevated blood pressure in follow-up studies in children (WHO, 1985). It has often failed to receive the attention given to earlier periods in childhood concerning health related issues and interpretation of anthropometry (The World Health Report, 2002). The present study is an endeavour to study the health and nutritional status of adolescents.

2. Materials and methods

The present descriptive cross-sectional study was conducted in Miraj from Aug 2009 to Sept 2010, 2370 adolescents in the age group of 15-19 yrs were included. Institutional ethical committee accorded ethical clearance for this study in Aug 2009. Prior permission was obtained from school and college Principals and higher authorities.

The purpose and process of study was explained to the teachers and students and parental consent was obtained. Pilot testing was done in schools to validate the proforma. There were totally 21 schools and has strength of 4,000-5,000 (of age 15-17 years). Total colleges in the study area were four with approximately 2,000 students (of age 17-19 years) 4 schools and 2 colleges were randomly selected.

Adolescents in the age group of 15-19 years and willing to participate in study were included and stratified into four groups i.e. 15-16, 16-17, 17-18, 18-19 yrs. It was decided to select 400 students from each stratum to study the calculated sample size of 1600. However, to achieve the relatively complete and higher figure and covering maximum number of students from each age group from a particular school/college, total sample size of 2370 was arrived. Adolescents below 15 yrs and above 19 yrs of age and not willing

to participate were excluded.

A pre-designed, pre-tested structural questionnaire was used for data collection. All the questions were explained to the students and total confidentiality was assured. Physical examination was undertaken after the interview was over. It includes anthropometric measurements such as height, weight and blood pressure. For recording blood pressure, students were individually called in a room and were allowed to be seated quietly for 5-10 mins to alley anxiety and restlessness.

Blood pressure was recorded in sitting position in right arm, with his or her back supported, feet on the floor and right arm supported so that cubital fossa is at heart level, using a standard mercury sphygmomanometer with appropriate cuff size. Systolic blood pressure was determined by the onset of the “tapping” Korotkoff sounds (K1) and fifth Korotkoff sound (K5), or the disappearance of Korotkoff sounds, was recorded as Diastolic blood pressure.

Hypertension was defined as average of two SBP or DBP readings recorded three mins apart that is greater than or equal to the 95th percentile for sex, age, and height on at least three separate occasions (Adolescents found hypertensive were referred to Govt. Medical College, Miraj for further evaluation and treatment. Data was entered in Microsoft excel sheet and analysis was done using Statistical software SPSS 16 version. Mean, standard deviation and χ^2 test were used for statistical analysis.

3. Results

Table 1 shows the general characteristics of the study participants. Study participants were evenly distributed among all the study groups.

Table.1. Socio-demographic Features of study subjects

Socio-demographic Features	Level of Features	Study Subjects					
		Male		Female		Total	
		No	%	No	%	No	%
Age (years)	15-16	418	24.9	190	27.3	608	25.7
	16-17	370	22.1	193	27.8	563	23.7
	17-18	437	26.1	170	24.5	607	25.6
	18-19	450	26.9	142	20.4	592	25
	Total	1675	100	695	100	2370	100
Religion	Hindu	1172	70	502	72.2	1674	70.6
	Muslim	285	17	107	17	392	16.5
	Christian	176	10.5	56	8.1	232	9.8
	Other	42	2.5	30	4.3	72	3
	Total	1675	100	695	100	2370	100
Socio-economic Class	Upper	457	27.3	201	28.9	658	27.8
	Middle	563	33.6	287	41.3	850	35.9
	Lower	655	39.1	207	29.8	862	36.3
	Total	1675	100	695	100	2370	100
Type of family	Nuclear	990	59.1	407	58.5	1397	59
	Joint	478	28.5	192	27.6	670	28.3
	Three generation	207	12.4	96	13.9	303	12.7
	Total	1675	100	695	100	2370	100

Table 2 depicts age-wise prevalence of hypertension. Out of 2370 adolescents in the age group of 15 to 19 years, 27 had hypertension (prevalence of 1.1%).

As observed in above table 3, 1545 (65.2%) study subjects have normal BMI. Overall prevalence of obesity was 3.0% and 753 (31.8%) adolescents were underweight. 1195 (71.3%) males were having normal BMI as compared to 350 (50.3%) females. 57(3.4%) 423 males were overweight while 15 (2.2%) females were overweight. The prevalence of under-nutrition was more in females ac-

counting for 47.5% as compared to males (25.3%).

Table 2. Age-wise prevalence of Hypertension

Age (years)	Study Subjects					
	Normotensive		Hypertensive		Total	
	No	%	No	%	No	%
15-16	607	99.8	1	0.2	608	100
16-17	561	99.7	2	0.3	563	100
17-18	600	98.9	7	1.1	607	100
18-19	575	97.1	17	2.9	592	100
Total	2343	98.9	27	1.1	2370	100

Table 3. Nutritional Status of Study subjects according to BMI

BMI	Study subjects					
	Male		Female		Total	
	No	%	No	%	No	%
Underweight	423	25.3	330	47.4	753	31.8
Normal	1195	71.3	350	50.3	1545	65.2
Overweight/ Obese	57	3.4	15	2.2	72	3
Total	1675	100	695	100	2370	100

Table 4 shows the prevalence of hypertension according to BMI of study participants. It can be observed from the above table that the prevalence of hypertension was markedly higher among overweight/obese adolescents, 26.7% as compared to adolescents with a BMI in the normal range (0.5%). Underweight study participants have a prevalence rate of 0.1%. This difference was found to be highly significant. On further statistical analysis, it was found that obese adolescents showed a risk of having hypertension 78.77 (95% C.I. for Odds Ratio 31.74-195.4) times that of adolescents with normal BMI.

Table 4. Prevalence of hypertension according to BMI

BMI	Study Subjects					
	Normotensive		Hypertensive		Total	
	No	%	No	%	No	%
Underweight	752	99.9	1	0.1	753	100
Normal	1538	99.5	7	0.5	1545	100
Overweight/ Obese	53	73.6	19	26.7	72	100
Total	2343	98.9	27	1.1	2370	100

$\chi^2 = 397.5, df = 1, p < 0.001, HS$

4. Discussion

It has been noted that the age related increase in BP might be attribute to increase in body mass. This was documented in the current study also where increasing body mass index had a significant positive relationship with increasing prevalence of hypertension. These findings were comparable with the studies conducted by Rames et al. (1978) and Verma et al. (1994).

Anand_ et al. (1996) observed that children with obesity had hypertension in 3.5% as compared to other children in which the prevalence was only 0.23%. Qing He et al. (2000), Rosner et al. (2000) also observed similar findings. The association between over-

weight and **hypertension** in children has also been reported in with study Sorof et al. (2002) where higher prevalence of **hypertension was observed** in overweight compared with lean children.

A study conducted by Mohan et al (2004) including total 3326 students found that there was significant increase in prevalence of hypertension with increased body mass index; those with normal body mass index had prevalence of hypertension of 4.52%, in overweight it was 15.33% and in obese it was 43.10%.

Hypertension in obese children may occur due to: (a) increased cardiac output, (b) increased blood volume, (c) excessive sodium intake, (d) sodium retention (d) increased steroid production (e) increased nervous system activity, and (f) hyperinsulinemia and (g) alteration in receptors for various pressor substances (Mohan *et al.*,2004). These might be the possible reasons for higher prevalence of hypertension in obese study participants, which is proved by this present study.

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